Title: Use of small unmanned aircraft to study the lower Arctic troposphere

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Abstract: The Arctic has seen substantial attention as an area of particular vulnerability to change. Despite a variety of observational efforts, understanding processes related to observed Arctic change requires new perspectives to allow us to gain information on spatial variability of surface and atmospheric quantities, increased sampling of the vertical structure of the atmosphere, and access to otherwise difficult-to-reach environments. Unmanned aircraft systems (UAS) provide opportunities to gain this insight. Recent deployments of two different UAS to Oliktok Point Alaska provide perspectives on the sort of information that these platforms can provide. Specifically, as part of the Evaluation of Routine Atmospheric Sounding Measurements using Unmanned Systems (ERASMUS) campaign, the NOAA Physical Sciences Division (PSD) and the University of Colorado (CU) have deployed two different unmanned aircraft systems, the 1-meter CU DataHawk2 and the 3.2-meter, 55 lb. CU Pilatus. These platforms will have completed four deployments to Oliktok Point across a variety of seasons. The primary missions have involved studies of high latitude boundary layers, with primary measurement targets for these aircraft including thermodynamic quantities, surface temperatures and turbulent surface fluxes (DataHawk2) as well as aerosol size distribution, broadband net radiation, and atmospheric thermodynamics (Pilatus).

In this presentation, we will provide an overview of the platforms deployed, the scientific goals of the deployments, an initial look at the measurements obtained, and comparison with the Regional Arctic System Model (RASM-ESRL), a regional model aimed at forecasting sea ice. Additionally, we will provide insight into the future of unmanned aircraft measurement activities related to Arctic research within PSD and discuss the importance of UAS measurements to development of process-level understanding required for model improvement.